colors are recessive to the full colors, but more commonly the lighter shades are epistatic to the intense ones and are interpreted as the result of a partial inhibitor or "palliator"; there is similar epistasis of the lighter stem colors to the darker; two inhibiting factors produce definitely localized effects in the flower, one affecting the central region of the flower, the other the periphery. In all of these unit characters the expected Mendelian ratios were obviously present except in several instances of "repulsion" and of partial coupling. Thus magenta was never found associated with the short style, and a partial coupling between magenta flower color and green stigma seems to indicate that there is a segregation on the plan 7:1:1:7 in one of the sexes, while in the other sex the segregation follows the usual plan 1:1:1:1.

The occurrence of dominant and recessive white in the flower color of the different varieties presents an interesting situation. In the varieties first investigated, the dominant white was always associated with red stems and the recessive white with green stems. An exception to this rule exists in the case of the variety "Pearl," in which dominant white and green stems are combined. KEEBLE and PELLEW[4] now report an exception in the opposite direction in "Snow King," a red-stemmed variety with either dominant or recessive white flowers. Crosses between this variety and various colored varieties gave different results according as the particular individual of "Snow King" used in the cross chanced to be dominant, heterozygous, or recessive in regard to a dominant white factor *W*. The heterozygous whites when crossed with colored varieties gave white and colored, 1:1 in the F_1, and these F_1 whites when self-fertilized produced an F_2 which in each case closely approximated the expected ratio, 13 white: 3 colored.—GEORGE H. SHULL.

An inhibiting factor in oats.—NILSSON-EHLE[5] describes a number of instances in which mutants resembling the wild oats (*Avena fatua*) have appeared in his cultures of numerous cultivated varieties of *Avena sativa*, the coefficient of mutation being about 1 in 10,000. These atavists had approximately the same congeries of characteristics regardless of the characteristics of the varieties in which they were discovered. Most frequently they were found in heterozygous combination with the cultivated varieties, but sometimes also in the pure extracted forms. That these could not have been the results of crosses with the wild oats is proved by the fact that when they appeared in a variety having white or yellow glumes, the atavist retained this recessive character. The heterozygotes proved to be in all cases intermediate between the atavists and the particular varieties in which they appeared. The fact that the atavistic type differs in each case by a single unit character, so that the whole group of wild characters appears in their

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[4] KEEBLE, F., and PELLEW, MISS C., White-flowered varieties of *Primula sinensis*. Jour. Genetics **1**:1–5. 1910.

[5] NILSSON-EHLE, H., Ueber Fälle spontanen Wegfallens eines Hemmungsfaktors beim Hafer. Zeit. Ind. Abstam. Vererb. **5**:1–37. *pl. 1*. 1911.

usual combination in one-fourth of the F_2 offspring, leads the author to the conclusion that the difference between the wild oats and these various cultivated varieties is due to the presence in the latter of an inhibiting factor which prevents the development of the wild characters. As he has never found among the numerous crosses he has made between different cultivated varieties any instance in which the atavists made up one-sixteenth of the F_2, as they should do if different varieties possessed different inhibiting factors, he concludes that the same inhibiting factor is present in all the cultivated varieties, and that the different degrees of development of the awns and hairiness of the glumes which have been found to be dependent upon independent genes, must remain latent in the wild oats until the origin of an inhibiting factor brings them to light. On this ground he argues that the degree of discontinuity which results from any mutation depends upon the number of latent genes which are brought into manifestation by it, and also that various apparent correlations may result from the disappearance of a factor which had simultaneously inhibited both of the characters which appear to be correlated. The author does not take into account the hypothesis of "variable potency," which could also be made to explain how the same inhibiting factor in the various cultivated varieties could produce such various degrees of development of awns, hairiness of the glumes, etc., as are displayed by them.—GEORGE H. SHULL.

Mitosis in Spinacia.—This extensive investigation by STOMPS,[6] written in Dutch, but with an eleven page résumé in German, deals with mitosis in both vegetative cells and in the microspore and megaspore mother cells.

The *2x* generation shows 12 chromosomes arranged in pairs, which can be distinguished not only in the nuclear plate but also in the prophase, and pairs probably persist in the resting nucleus. No continuous spirem is formed, the two components of each pair, as soon as they can be distinguished, having two free ends. A longitudinal splitting of the chromosome occurs in early prophase, a longitudinal row of vacuoles appearing, and these, by increasing in size, split the chromosome. This mode of splitting results in threads with alternating thickened and slender portions, but STOMPS does not regard the thickened portions as chromomeres or ids, nor does he regard the slender portions as linin, but both are the same in substance.

In the prophase of the reduction division, before synapsis, the 12 chromosomes fuse in pairs, forming 6, each with two free ends. There is not only a pairing, but also a genuine fusion of the two chromosomes of each pair. No continuous single or double thread is formed. As the nucleus comes out of synapsis, one sees 6 chromosomes, each evidently double, and the two mem-

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[6] STOMPS, THEO. J., Kerndeeling en Synapsis bij *Spinacia oleracea*. 8vo. pp. 162. *pls.* 2. 1910. A briefer account in German, which is partly a summary and partly a translation of the original, is published in Biol. Centralbl. **31**: 257–320. *pls.* 1–3. 1911.